REMARKS

Applicant requests favorable reconsideration and allowance of the subject application in view of the preceding amendments and the following remarks.

To place the subject application in better form, the specification has been amended to correct minor informalities, including one noted by the Examiner. Also, a new abstract is presented in accordance with preferred practice. No new matter has been added by these changes.

Claims 1-30 are presented for consideration. Claims 1, 3, 5-11, 13, 15-21, 23 and 25-30 are independent. Claims 1, 3, 9-11, 13, 15-21, 23, 29 and 30 have been amended to clarify features of the invention. Support for these changes can be found in the original application, as filed. Therefore, no new matter has been added.

Applicant requests favorable reconsideration and withdrawal of the rejections set forth in the above-noted Office Action.

Claims 1-30 were rejected under 35 U.S.C. § 102 as being anticipated by either U.S. Patent No. 6,342,942 to Uzawa or U.S. Patent No. 6,163,366 to Okamoto. Applicant submits that the cited art does not teach or suggest many features of the present invention, as recited in the independent claims. Therefore, these rejections are respectfully traversed.

The present invention, as recited in the independent claims, relates to various aspects of exposure methods, device manufacturing methods, and exposure apparatus.

In one aspect of the invention, as recited in independent claims 1, 5, 6, 9, 11, 15, 16, 19, 21, 25, 26 and 29, the processing order in the first and second sample shot processes is

determined so as to shorten the interval between the last shot of the first sample shot process and the first shot of the second sample shot process.

In another aspect of the invention, as recited in independent claims 3, 7, 8, 10, 13, 17, 18, 20, 23, 27, 28 and 30, the processing order in the sample shot process and the exposure process is determined so as to shorten the interval between the last shot in the sample shot process and the first shot in the exposure process.

By such arrangements, the present invention provides significant advantages in increased throughput, for example. Applicant submits that the cited art does not teach or suggest such features of the present invention, as recited in the independent claims.

The Uzawa patent shows a scan type exposure apparatus in which scan exposure is performed while some shots are intermittently skipped, to thereby attain high precision and to provide a large throughput exposure operation. The Uzawa patent, however, only relates to the processing order in the exposure process. Specifically, the Uzawa patent does not at all mention the processing order in sample shot processes, such as prealignment, global tilting, global alignment and the like. Accordingly, Applicant submits that the Uzawa does not teach or suggest determining a processing order in an exposure process in a way that is effective to shorten the interval between the last shot in a sample shot process and a first shot in an exposure process, in the manner of the present invention.

The Okamoto patent relates to a high-precision alignment process in which a calculation result in an EGA (sample shot process) is corrected on the basis of distortion data of a projection lens. The Okamoto patent, however, is completely silent as to any processing order in an

exposure process, as proposed by the present invention. Further, the Okamoto patent does not teach or suggest determining a processing order in sample shot processes in an effective manner to improve the throughput, as is provided by the present invention.

For the reasons noted, Applicant submits that the Uzawa and Okamoto patents do not teach or suggest the salient features of Applicant's present invention, as recited in the independent claims. Accordingly, Applicant submits that the present invention, as recited in independent claims 1, 3, 5-11, 13, 15-21, 23 and 25-30, is patentably defined over the cited art, whether that art is considered individually or in combination.

Dependent claims 2, 4, 12, 14, 22 and 24 also should be deemed allowable, in their own right, for defining other patentable features of the present invention in addition to those recited in their respective independent claims. Further individual consideration of these dependent claims is requested.

Applicant further submits that the instant application is in condition for allowance. Favorable reconsideration, withdrawal of the rejections set forth in the above-noted Office Action and an early Notice of Allowance are requested.

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Applicant's undersigned attorney may be reached in our Washington, D.C. office by telephone at (202) 530-1010. All correspondence should be directed to our address listed below.

Respectfully submitted,

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APPENDIX A

IN THE ABSTRACT

[An exposure method and an exposure apparatus are disclosed wherein one or more plural sample shot processes are made to a substrate and an exposure process is made to the substrate after completion of the sample shot process or processes. The procedure includes a first determining step for determining the processing order in a first sample shot process, of the plural sample shot processes, and a second determining step for determining the processing order in a second sample shot process to be made after the first sample shot process, wherein, in at least one of the first and second determining steps, the determination is made under a condition that an interval between a shot to be processed last in the first sample shot process and a shot to be processed first in the second sample shot process is shortened.]

-- An exposure method and an exposure apparatus in which one or more plural sample shot processes are made to a substrate and an exposure process is made to the substrate after completion of the sample shot process or processes. The procedure includes a first determining step for determining the processing order in a first sample shot process, of the plural sample shot processes, and a second determining step for determining the processing order in a second sample shot process to be made after the first sample shot process. In at least one of the first and

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second determining steps, the determination is made under a condition that an interval between a shot to be processed last in the first sample shot process and a shot to be processed first in the second sample shot process is shortened. --

IN THE SPECIFICATION

Please substitute the paragraph beginning at page 1, line 9, with the following.

-- The wafer processing procedure for producing "exposed wafers" mainly comprises sample shot processes such as global tilting for removing any tilt of a wafer and global alignment for positioning the wafer, as well as an exposure process. Many attempts have been made to [shortening] shorten the time required for each process, to thereby improve the productivity of "exposed wafers", that is, the throughput. --

Please substitute the paragraph beginning at page 3, line 18, with the following.

-- Figures 8A - 8D are schematic views, respectively, for explaining examples of a first processing shot in an exposure process and the order of processing the remaining shots in that process, as determined in accordance with the sequence flow of the Figure 6 example. --

Please substitute the paragraph beginning at page 4, line 4, with the following.

-- Preferred embodiments of the present invention will now be described with reference to the accompanying drawings. Briefly, in these embodiments, the order of processing sample shots, the positions of sample shots, the processing order in an exposure process and the like may

be determined so as to shorten the distance between the last shot in a certain sample shot process and the first shot in a subsequent sample shot process and/or the distance between the last shot in a certain sample shot process and the first shot in a subsequent exposure process (hereinafter, "transition distance"). This effectively [shorten] shortens the movement time for a stage which moves through the transition distance. --

Please substitute the paragraph beginning at page 6, line 22, and ending on page 7, line 4, with the following.

-- As the sequence starts, first, one of the sample shots Aa - Ad which is closest to the exposure shot No. 1 is determined by calculation on the basis of the X-Y coordinate positions of them (step S21). More specifically, [where] when the X-Y coordinate of the exposure shot No. 1 is (X_1, Y_1) while the X-Y coordinates of the sample shots Aa - Ad are (Xa, Ya), (Xb, Yb), (Xc, Yc) and (Xd, Yd), respectively, the distances Da - Dd of the sample shots Aa - Ad from the exposure shot No. 1 are given by the following equations. --

Please substitute the paragraph beginning at page 7, line 27, and ending on page 8, line 5, with the following.

-- The above-described procedure for determining a shot closest to a particular shot, by calculation on the basis of the X-Y coordinate position thereof, can be applied to any other case to be described below. Details of the procedure will, therefore, be omitted in the following description. --

Please substitute the paragraph beginning at page 9, line 13, with the following.

-- Figure 4 shows a sequence flow for determining the order of processing sample shots in each sample shot process to be made to a wafer having a shot layout such as shown in Figure [4] 5. The number of sample shots in each sample shot process as well as the shot layout in the exposure process are selectable. In this example, the selection may be made to be described below. However, in this example, the number of sample shots for the prealignment process is fixed to two. More specifically, the number of sample shots for prealignment is two (fixed), the number of sample shots for global tilting is four, and the number of sample shots for global alignment is four. --

Please substitute the paragraph beginning at page 12, line 14, and ending on page 13, line 4, with the following.

-- Subsequently, shot options to be chosen for sample shots in the prealignment process are selected (step S47). In this example, for better correction precision to wafer rotation, a condition that the options should be those shots each being located at the outermost periphery of the shot layout and being present on a straight line passing through the center of the shot layout and extending [in] parallel to the X axis, is set. However, any other rule may be used. In this example, therefore, shot options are those shots marked with triangles in Figure 5, that is, the shots with exposure shot Nos. 11, 16, 17 and 22. Next, among these shot options, one which is closest to the first processing shot T_1 to be processed first in the global tilting process is detected

by calculation on the basis of the X-Y coordinate positions of them (step S48). In this example, a shot with exposure shot No. 17 is detected so. --

Please substitute the paragraph beginning at page 14, line 2, and ending on page 15, line 5, with the following.

-- Figure 6 shows a sequence flow for determining the order of processing sample shots in each sample shot process as well as the order of processing exposure shots in an exposure process which are to be made to a wafer having a shot layout such as shown in Figure 7. The number of sample shots and positions of them in each sample shot process as well as the shot layout in the exposure process are selectable. Figure 7 shows an example of the selection. Here, it is assumed that the processing order for sample shots in the prealignment process is already determined as an order of Pa and Pb, and that the exposure order is not yet determined. In Figure 7, Pa and Pb denote sample shots for prealignment (two shots in this example), Ta - Td denote sample shots for global tilting (four shots in this example), and Aa - Ad are sample shots for global alignment (four shots in this example). Also, Ea - Ed [denoted] denote shot options for a first processing shot to be processed first in the exposure process. Numbers 1 - 32 denote exposure shot [Nos.] numbers. The order of exposure shots is determined in accordance with the first processing shot. In this example, the shot options to be chosen for the first processing shot in the exposure process should be those shots which are located at the opposite ends of the top or bottom array (row) of the shot layout, that is, shots Ea - Ed. Also, when any one of these shots is

selected as the first processing shot, the processing order will be determined in a manner as shown in a corresponding one of Figure 8A - 8D. However, any other rule may be used. --

Please substitute the paragraph beginning at page 15, line 6, with the following.

-- The processing order in the prealignment process is in the order of Pa and Pb, as described above. Thus, as the sequence starts, first, one of the sample shots Ta - Td which is closest to the Pb is determined by calculation on the basis of the X-Y coordinate positions of them (step S61). In this example, the sample shot Td is determined so. Subsequently, the processing order for the sample shots Ta - Td is so determined that the thus detected shot is taken as the first shot. The last shot to be processed last is named as shot T_4 (step S62). Here, in this example, in the sample shot process, the processing is going to be made to the sample shots counterclockwise. However, any other rule may be used in place of the counterclockwise processing. In this example, therefore, the sample shots will be processed in an order of Td, Ta, Tb, and Tc. The first last shot T_4 for the global tilting process is the sample shot Tc. --

Please substitute the paragraph beginning at page 16, line 10, with the following.

-- Subsequently, among the shots Ea - Eb, one which is closest to the shot A_4 (shot Ab) is detected by calculation on the basis of the X-Y coordinate positions of them (step S65). In this example, the shot Eb is determined so. Thus, the first processing shot to be processed first in the exposure process is the shot Eb. Also, the order of an exposure process corresponding to this is determined such as shown in Figure 8B (step S66). --

Please substitute the paragraph beginning at page 17, line 2, with the following.

-- Figure 9 is a flow chart of a procedure for the manufacture of microdevices such as semiconductor chips (e.g., ICs or LSIs), liquid crystal panels, CCDs, thin film magnetic heads or micro-machines, for example. --

Please substitute the paragraph beginning at page 17, line 7, with the following.

-- Step 1 is a design process for designing a circuit of a semiconductor device. Step 2 is a process for making a mask on the basis of the circuit pattern design. Step 3 is a process for preparing a wafer by using a material such as silicon. Step 4 is a wafer process (called a pre-process) wherein, by using the so prepared mask and wafer, circuits are practically formed on the wafer through lithography. Step 5 subsequent to this is an assembling step (called a post-process) wherein the wafer having been processed by step 4 is formed into semiconductor chips. This step includes an assembling (dicing and bonding) process and a packaging (chip sealing) process. Step 6 is an inspection step wherein an operation check, a durability check and so on for the semiconductor devices provided by step 5, are carried out. With these processes, semiconductor devices are completed and they are shipped (step 7). --

IN THE CLAIMS

1. (Amended) An exposure method including plural sample shot processes to be made to a substrate and an exposure process to be made to the substrate after completion of the sample shot processes, said method comprising:

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a first determining step for determining the processing order in a first sample shot process, of the plural sample shot processes; and

a second determining step for determining the processing order in a second sample shot process to be made after the first sample shot process[;],

wherein, in at least one of [the] said first and second determining steps, the determination is made under a condition that an interval between a shot to be processed last in the first sample shot process and a shot to be processed first in the second sample shot process is shortened.

3. (Amended) An exposure method including a sample shot process to be made to a substrate and an exposure process to be made to the substrate after completion of the sample shot process, said method comprising:

a first determining step for determining the processing order in the sample shot process; and

a second determining step for determining the processing order in the exposure process to be made after the sample shot process[;],

wherein, in at least one of [the] said first and second determining steps, the determination is made under a condition that an interval between a shot to be processed last in the sample shot process and a shot to be processed first in the exposure process is shortened.

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9. (Amended) An exposure method including plural sample shot processes to be made to a substrate and an exposure process to be made to the substrate after completion of the sample shot processes, said method comprising:

a first determining step for determining the processing order in a first sample shot process, of the plural sample shot processes; and

a second determining step for determining the processing order in a second sample shot process to be made after the first sample shot process[;],

wherein, in at least one of [the] said first and second determining steps, the determination is made so that a difference between a position of a shot to be processed last in the first sample shot process and a position of a shot to be processed first in the second sample shot process is placed within a range of a single shot with respect to a vertical and longitudinal size in a shot layout.

10. (Amended) An exposure method including a sample shot process to be made to a substrate and an exposure process to be made to the substrate after completion of the sample shot process, said method comprising:

a first determining step for determining the processing order in the sample shot process; and

a second determining step for determining the processing order in the exposure process to be made after the sample shot process[;],

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wherein, in at least one of [the] said first and second determining steps, the determination is made so that a difference between a position of a shot to be processed last in the sample shot process and a position of a shot to be processed first in the exposure process is placed within a range of a single shot with respect to a vertical and longitudinal size in a shot layout.

11. (Amended) A device manufacturing method, comprising:

an exposure step including plural sample shot processes to be made to a substrate and an exposure process to be made to the substrate after completion of the sample shot processes, said exposure step further including (i) a first determining step for determining the processing order in a first sample shot process, of the plural sample shot processes, and (ii) a second determining step for determining the processing order in a second sample shot process to be made after the first sample shot process, wherein, in at least one of [the] said first and second determining steps, the determination is made under a condition that an interval between a shot to be processed last in the first sample shot process and a shot to be processed first in the second sample shot process is shortened; and

a developing step for performing a development process to the substrate having been processed [at] in said exposure step, for production of devices on the substrate.

13. (Amended) A device manufacturing method, comprising:

an exposure step including a sample shot process to be made to a substrate and an exposure process to be made to the substrate after completion of the sample shot process, said exposure step further including (i) a first determining step for determining the processing order in the sample shot process, and (ii) a second determining step for determining the processing order in the exposure process to be made after the sample shot process, wherein, in at least one of [the] said first and second determining steps, the determination is made under a condition that an interval between a shot to be processed last in the sample shot process and a shot to be processed first in the exposure process is shortened; and

a developing step for performing a development process to the substrate having been processed [at] in said exposure step, for production of devices on the substrate.

15. (Amended) A device manufacturing method, comprising:

an exposure step including plural sample shot processes to be made to a substrate and an exposure process to be made to the substrate after completion of the sample shot processes, said exposure step further including (i) a first determining step for determining the processing order in a first sample shot process, of the plural sample shot processes, and (ii) a second determining step for determining the processing order in a second sample shot process to be made after the first sample shot process, in accordance with a position of a shot to be processed last in the first sample shot process; and

a developing step for performing a development process to the substrate having been processed [at] in said exposure step, for production of devices on the substrate.

16. (Amended) A device manufacturing method, comprising:

an exposure step including plural sample shot processes to be made to a substrate and an exposure process to be made to the substrate after completion of the sample shot processes, said exposure step further including (i) a first determining step for determining the processing order in a first sample shot process, of the plural sample shot processes, and (ii) a second determining step for determining the processing order in a second sample shot process to be made prior to the first sample shot process, on the basis of a position of a shot to be processed first in the first sample shot process; and

a developing step for performing a development process to the substrate having been processed [at] <u>in</u> said exposure step, for production of devices on the substrate.

17. (Amended) A device manufacturing method, comprising:

an exposure step including a sample shot process to be made to a substrate and an exposure process to be made to the substrate after completion of the sample shot process, said exposure step further including (i) a first determining step for determining the processing order in the sample shot process, and (ii) a second determining step for determining the processing order in the exposure process to be made after the sample shot process, in accordance with a position of a shot to be processed last in the sample shot process; and

a developing step for performing a development process to the substrate having been processed [at] <u>in</u> said exposure step, for production of devices on the substrate.

18. (Amended) A device manufacturing method, comprising:

an exposure step including a sample shot process to be made to a substrate and an exposure process to be made to the substrate after completion of the sample shot process, said exposure step further including (i) a first determining step for determining the processing order in the exposure process, and (ii) a second determining step for determining the processing order in the sample shot process to be made prior to the exposure process, in accordance with a position of a shot to be processed first in the position of a shot to be processed first in the exposure process; and

a developing step for performing a development process to the substrate having been processed [at] <u>in</u> said exposure step, for production of devices on the substrate.

19. (Amended) A device manufacturing method, comprising:

an exposure step including plural sample shot processes to be made to a substrate and an exposure process to be made to the substrate after completion of the sample shot processes, said exposure step further including (i) a first determining step for determining the processing order in a first sample shot process, of the plural sample shot processes, and (ii) a second determining step for determining the processing order in a second sample shot process to be made after the first sample shot process, wherein, in at least one of [the] <u>said</u> first and second determining steps, the determination is made so that a difference between a position of a shot to be processed last in the first sample shot process and a position of a shot to be processed first in

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the second sample shot process is placed within a range of a single shot with respect to a vertical and longitudinal size in a shot layout; and

a developing step for performing a development process to the substrate having been processed [at] in said exposure step, for production of devices on the substrate.

20. (Amended) A device manufacturing method, comprising:

an exposure step including a sample shot process to be made to a substrate and an exposure process to be made to the substrate after completion of the sample shot process, said exposure step further including (i) a first determining step for determining the processing order in the sample shot process, and (ii) a second determining step for determining the processing order in the exposure process to be made after the sample shot process, wherein, in at least one of [the] said first and second determining steps, the determination is made so that a difference between a position of a shot to be processed last in the sample shot process and a position of a shot to be processed first in the exposure process is placed within a range of a single shot with respect to a vertical and longitudinal size in a shot layout; and

a developing step for performing a development process to the substrate having been processed [at] in said exposure step, for production of devices on the substrate.

21. (Amended) An exposure apparatus wherein plural sample shot processes are made to a substrate and an exposure process is made to the substrate after completion of the sample shot processes, said apparatus comprising:

first determining means for determining the processing order in a first sample shot process, of the plural sample shot processes; and

second determining means for determining the processing order in a second sample shot process to be made after the first sample shot process[;],

wherein, in at least one of said first and second determining means, the determination is made under a condition that an interval between a shot to be processed last in the first sample shot process and a shot to be processed first in the second sample shot process is shortened.

23. (Amended) An exposure apparatus wherein a sample shot process is made to a substrate and an exposure process is made to the substrate after completion of the sample shot process, said apparatus comprising:

first determining means for determining the processing order in the sample shot process; and

second determining means for determining the processing order in the exposure process to be made after the sample shot process[;],

wherein, in at least one of [the] <u>said</u> first and second determining means, the determination is made under a condition that an interval between a shot to be processed last in the sample shot process and a shot to be processed first in the exposure process is shortened.

29. (Amended) An exposure apparatus wherein plural sample shot processes are made to a substrate and an exposure process is made to the substrate after completion of the sample shot processes, said apparatus comprising:

first determining means for determining the processing order in a first sample shot process, of the plural sample shot processes; and

second determining means for determining the processing order in a second sample shot process to be made after the first sample shot process[;],

wherein, in at least one of [the] said first and second determining means, the determination is made so that a difference between a position of a shot to be processed last in the first sample shot process and a position of a shot to be processed first in the second sample shot process is placed within a range of a single shot with respect to a vertical and longitudinal size in a shot layout.

30. (Amended) An exposure apparatus wherein a sample shot process is made to a substrate and an exposure process is made to the substrate after completion of the sample shot process, said apparatus comprising:

first determining means for determining the processing order in the sample shot process; and

second determining means for determining the processing order in the exposure process to be made after the sample shot process[;],

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wherein, in at least one of [the] said first and second determining means, the determination is made so that a difference between a position of a shot to be processed last in the sample shot process and a position of a shot to be processed first in the exposure process is placed within a range of a single shot with respect to a vertical and longitudinal size in a shot layout.